

p. 307). The so-called genus *Callocardia*, founded upon this species, represented hitherto only by a single valve in the British Museum, and supposed to belong to the family Isocardiidae, certainly belongs to the Veneridae, and cannot with any propriety be separated from the section *Caryatis* of the ancient Lamarckian genus *Cytherea*. This being the case it becomes necessary to change the specific name given to Mr. Adams's type, the name *Cytherea guttata* being preoccupied by Römer. I therefore propose for it the name of

#### CYTHEREA (CARYATIS) ISOCARDIA.

The shell is described by Mr. Edgar A. Smith in his report of the Lamellibranchiata of the 'Challenger,' from the before-mentioned single valve. There is little to add to that description. The hinge is almost identical with that of *C. hungerfordi*, the shell is more inflated and the umbones more distant. Of the two specimens, one is beautifully painted with squarish light brown markings, and the other has only angular markings and spots about the dorsal margin.

#### EXPLANATION OF PLATE XI.

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|---|---|
| Fig. 1-3. <i>Cypræa hungerfordi</i> , p. 208.       | Fig. 12. <i>Lima smithi</i> , p. 207.   |
| 4. <i>Cytherea (Caryatis) hungerfordi</i> , p. 212. | 13. <i>Helix boxalli</i> , p. 211.      |
| 5. <i>Trochus ponsonbyi</i> , p. 209.               | 14. — <i>cyclostremoides</i> , p. 212.  |
| 6-7. — <i>exquisitus</i> (magnified), p. 210.       | 15. <i>Malletia angulata</i> , p. 208.  |
| 8-9. <i>Columbella filbyi</i> , p. 208.             | 16. <i>Pleurotoma bulowi</i> , p. 211.  |
| 10. <i>Engina angulata</i> , p. 210.                | 17. — <i>fultoni</i> , p. 210.          |
| 11. <i>Coralliophila turrita</i> , p. 209.          | 18. <i>Turritella robusta</i> , p. 211. |
|   | 19. <i>Cassis cerniea</i> , p. 211.     |
|   | 20. <i>Lima concentrica</i> , p. 207.   |

#### 3. Observations upon an Annelid of the Genus *Æolosoma*.

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#### (Plate XII.)

In looking over a sample of water from a small tank belonging to Mr. Bartlett, Mr. F. W. Headley noted, and directed my attention to, a small worm clinging to a fragment of duckweed. This I recognized as an example of the freshwater Annelid *Æolosoma*. I obtained further supplies of water from the same tank which was found to be swarming with this little worm. The animals, however, were only rarely observed swimming freely in the clear water, but a large number could be at once brought into view by simply stirring up the duckweed with the dipping-tube; if left to themselves, they rapidly made their way up to the surface of the water where the duckweed was floating, and disappeared from view. Individuals

placed in a drop of water upon a slide moved about with a rapid steady motion, resembling, as Vejdovsky has pointed out, that of a Planarian. Occasionally the movements were more sudden, the worm rapidly twisting itself to one side or to the other. Examined under a lens of moderately high magnifying-power, it was evident that the movements of the animal were caused by the contractions of the muscular layer of the parietes.

The muscular pharynx is used by the animal as a sucker ; it attaches itself so firmly by this, that a comparatively violent disturbance of the water is requisite to detach it. When placed upon a slide in a drop of water and covered by a cover-glass, the worms nearly always attached themselves to the latter ; I found it, indeed, almost difficult to study the living worm from the dorsal surface. This habit is probably due to the fact that the worm crawls about on the under surface of the flattened branches of the duckweed. As Vejdovsky has pointed out, the oral segment and the procephalic lobe are the most contractile portions of the animal's body, though it can shorten itself and increase its length within rather wide limits. The individuals were in a state of active division, but I did not discover the sexual organs. Such are the most striking facts with regard to the habits of the present species of *Æolosoma* that have come under my observation.

Our knowledge of the structure of this genus is summed up in Vejdovsky's recent work upon the Oligochaeta<sup>1</sup>, where there is also to be found a critical account of the described species. Since the publication of that work, Vejdovsky has added a new species<sup>2</sup>, *Æolosoma variegatum*, to the three which have been sufficiently characterized to admit of an adequate definition (*Æ. quaternarium*, *Æ. ehrenbergi*, and *Æ. tenebrarum*) ; the species which I have investigated comes nearest to *Æ. variegatum*, but is, I believe, not identical with that species.

The worm agrees with *Æ. variegatum* in the green colour of the oil-globules. Zacharias<sup>3</sup> has lately investigated an *Æolosoma*, which may be identical with *Æ. variegatum* or with my own species, supposing that they are distinct, and has suggested that these green bodies may be *Algæ* ; they were observed in course of division. I can, however, confirm Vejdovsky's statement that these bodies are coloured black by osmic acid, which is strong evidence of their being of a fatty nature ; furthermore, a careful observation of the living worm under a high power shows that these green droplets change their form, as the animal moves about, quite after the fashion of an oil-globule ; in the third place, staining with iodine showed no trace whatever of the starch reaction. The green oil-globules were of different sizes, and showed almost every tint of green from a pale yellowish to a dark blue-green ; there appeared, however, to be no special relation between the size and the colour. They were far more abundant than Vejdovsky's figures show them to be in

<sup>1</sup> System und Morphologie der Oligochaeten : Prag, 1884.

<sup>2</sup> Sitzungsab. böhm. Gesellsch. f. Wissensch. 1885.

<sup>3</sup> Zeitschr. f. wiss. Zool. 1885.

*Æ. variegatum*. Very frequently the epidermic cells contained masses of a yellow substance (Plate XII. fig. 8) which was not blackened by osmic acid, and which may, perhaps, be an excretory product of the same nature as that which occurs in the cells of the peritoneum which clothe the dorsal blood-vessel and the gut. These yellow masses appeared to be most frequent upon the prostomium. Vejdovsky has suggested<sup>1</sup> that Leydig's *Æ. niveum* may be identical with his *Æ. variegatum*. The former species, however, has colourless oil-globules; but, as Leydig<sup>2</sup> pointed out, d'Udekem<sup>3</sup> has stated that in *Æ. quaternarium* the red oil-drops are recognizable in the embryo, and Maggi's figures<sup>4</sup> of a very closely allied, if not identical, species show the same thing. Still *Æ. variegatum* is so far like *Æ. niveum* in that it possesses colourless in addition to coloured oil-globules, and it agrees in other particulars to be referred to presently. In the species described in the present paper I also found colourless oil-bodies.

The anterior margin of the prostomium is furnished with delicate chitinous processes as in *Æ. variegatum*; and the under surface (Plate XII. fig. 2) of the prostomium is ciliated as in that and other species.

The number of setæ in the bundles of *Æ. variegatum* is stated to vary<sup>5</sup>, but the approximate number per bundle tabulated in Vejdovsky's memoir upon that worm is less than in the present species. My species may differ as to the number of setæ per bundle; except in the last few segments the number ranged from 4-6. Their shape is perfectly similar to that of the setæ in *Æ. variegatum*.

The accompanying drawing (Plate XII. fig. 3) shows the two seta-bundles of one side of the body highly magnified; each bundle is implanted in a cellular sac which is plainly continuous with the epidermis, and is no doubt derived from it; the sac is made up of 8-10 nucleated cells; it is attached to the body-wall by numerous unicellular muscular fibres, each with a single nucleus at about the middle of its length. The two seta-bundles are attached to each other by a flat band of muscular tissue (*sm*), which is wider at its attached extremities than in the middle; this muscular band is longitudinally striate, and is of a totally different appearance from the unicellular muscular fibres above mentioned.

I recognized the *nerve-ganglion* in the prostomium and the *ciliated pits*, which lie on either side in the furrow which separates the prostomium from the peristomial segment. The ciliation of the prostomium extends as far as the ciliated pit.

The *alimentary tract* shows but little difference from that of other species; observation of the living worm as well as of transverse sections (fig. 6) show that in my species the whole of the intestine is ciliated.

The *vascular system* calls for no comment; the contained blood

<sup>1</sup> System u. Morph. &c. p. 113, footnote.

<sup>2</sup> Müller's Arch. 1865.

<sup>3</sup> Bull. Acad. Belg. 1861.

<sup>4</sup> Soc. Ital. Sci. Nat. 1865.

<sup>5</sup> I am indebted to Prof. Vejdovsky for a German translation of a part of his memoir upon *Æ. variegatum*, which is in Bohemian.

is colourless as in all the other species except *Æ. ehrenbergii*, where, according to Lankester<sup>1</sup>, it is of a pinkish colour.

There are a large number of pairs of nephridia present, while in *Æ. variegatum* there are only three pairs, occupying segments 4-6. They are very readily visible, and the terminal aperture into the cœlom is extremely obvious, lying midway between two successive seta-bundles. The cœlomic aperture can hardly be termed a "funnel," as it is only just perceptibly wider than the rest of the tube. The external orifice of the nephridium is placed close to the median ventral line. Although the segmentation of *Æolosoma* does not affect the cœlom, there being no mesenteries present, it is clear that the position of the nephridia is such that, were mesenteries to make their appearance, each nephridium would be entirely contained in a single segment; the external orifice is in fact in advance of the cœlomic aperture (fig. 1). This is of some little importance, inasmuch as in *Otenodrilus*<sup>2</sup>, undoubtedly a near ally of *Æolosoma*, the single pair of nephridia are entirely contained within the first segment of the body. Again, in *Polygordius*<sup>3</sup> the funnels of the nephridia, although they come into close contact with the septum which divides the segment containing the nephridium from the one in front, do not actually perforate it. *Polygordius* is certainly a very primitive Annelid; and since the same conditions obtain in the Capitellidæ and other Chætopods, there are some reasons for believing that the restriction of a nephridium to a single segment is primitive. On the other hand, it is almost universally the case among the Oligochæta that the funnel lies in the segment in front of that which bears the external aperture of the nephridium. Again, the nephridia of *Æolosoma* are, as has been pointed out by Vejdovsky, attached to the parietes by simple unicellular muscle-fibres. This is perhaps to be looked upon as a primitive arrangement, since the embryonic nephridium of *Allolobophora* is, according to Lehmann, attached in a similar fashion<sup>4</sup>. The characters of the funnel are important; so far as I can ascertain from a single fortunate section (fig. 4) it is composed of only two cells; there are at any rate only two nuclei present, and one of these is rather in advance of the other. It is a fact which favours some views which I have put forward elsewhere<sup>5</sup>, as to the origin of the Annelid from the Platyhelminth excretory system, that in this primitive segmented worm the nephridial funnel should be, at most, two-celled. As to the structure of the nephridia, they consist, as in all Oligochæta, of "drain-pipe cells."

The difference in the number of the nephridia between the individuals which I have examined and those which Vejdovsky has

<sup>1</sup> Linn. Trans. vol. xxvi. 1869.

<sup>2</sup> The most recent paper known to me on this worm is by Dr. Scharff. Q. J. M. S. vol. xxvii. n. s.

<sup>3</sup> Fauna und Flora des Golfes von Neapel, xiv. Monograph of *Polygordius*, by L. J. Fraipont.

<sup>4</sup> Jen. Zeitschr. 1888, pl. xx. fig. 7.

<sup>5</sup> Q. J. Mier. Sci. 1888, pt. i.



termed *Æ. variegatum* leads me to believe that the individuals from the Society's Gardens belong to a distinct species; the fact also that the first nephridium is situated in the first setigerous segment, distinguishes my species from *Æ. variegatum*. I may fairly lay stress upon this point of difference, as it furnishes a useful character in distinguishing the remaining species of the genus. Leydig's observations upon *Æ. niveum* support Vejdovsky's belief that this species may be identical with his *Æ. variegatum*, as in both there are no nephridia in the œsophageal region.

The accompanying drawing (Plate XII. fig. 2) shows all the remaining points in the structure of *Æolosoma* to which I wish to direct attention. The cavity of the prostomium is traversed by numerous unicellular muscular fibres, which, when seen on a dorsal or ventral view of the animal, have the appearance of being frayed out at their point of insertion on to the body-wall, forming a star-like figure<sup>1</sup>. Besides these, the head-cavity is partly occupied by a network formed by the anastomosis of similar fibres, as in *Dinophilus*<sup>2</sup>, &c.; elsewhere the cœlom is only traversed by the unicellular fibres. Beneath the epidermis there is a single row of circular muscular fibres, which is continued over the pharynx. Beneath the circular fibres is a single row of longitudinal fibres of a somewhat greater thickness than the last; these do not appear to be continued over the pharynx.

The nerve-ganglion is half cellular and half fibrous (fig. 2, *n*); it appears to be wholly cellular in other species.

The number and disposition of the nephridia appear to me sufficient to distinguish this species, which I have great pleasure in associating with the name of my friend Mr. F. W. Headley, Assistant Master at Haileybury College.

#### EXPLANATION OF PLATE XII.

- Fig. 1. *Æolosoma headleyi*, highly magnified, from the ventral aspect.  
 2. Longitudinal section through prostomium and first segments.  
 3. Section through seta-sac.  
 4. Section to show nephridial funnel.  
 5, 6. Transverse and longitudinal sections through intestine.  
 7. Ciliated cells from intestine, highly magnified, to show striate free border.  
 8. Granular masses, colourless or yellow, contained in epidermis cells of prostomium.

#### Reference Letters.

*bl.* Blood-space. *v.v.* Ventral blood-vessel. *n.* Nerve-ganglion. *m.* Longitudinal muscular fibres. *m'*. Transverse muscular fibres. *ep.* Epidermis. *nep.* Nephridia. *o.* External orifice of nephridia. *f.* Funnel of nephridia. *c.* Intracœlomic muscular bands. *s.* Setae. *s'*. Seta-sac. *sm.* Band of muscles uniting two seta-bundles. *ph.* Pharynx.

<sup>1</sup> Cf. Vejdovsky, SB. böhm. Gesells. &c. fig. 3.

<sup>2</sup> Weldon, Q. J. Micr. Sci. 1886.